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ABSTRACT

In an effort to determine whether the metacognitive strategy of self-questioning enhances lecture comprehension, 56 Honors Program ninth graders in two sections of a freshman honors world history course were assigned to four conditions. Subjects: (1) were trained to pose questions for themselves during classroom lectures and to use their questions to engage in reciprocal peer-questioning and responding after lectures; (2) engaged in self-questioning during lectures and answered their own questions; (3) discussed lecture material in small cooperative groups; and (4) reviewed the lecture material independently. The fourth condition was the control condition. On post-practice and 10-day maintenance tests, participants in the self-questioning with reciprocal peer-questioning group and the self-questioning only group showed lecture comprehension superior to that of participants in the discussion and control groups. Results suggest that use of a self-questioning strategy can improve high school students' comprehension of lectures. Students can maintain this strategy when external prompts are removed. The metacognitive strategy can be readily taught to high school students and incorporated into their real-world classroom learning environment. A list of question stems and student-generated sample questions are provided. (Author/RH)

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Effects of a Metacognitive Strategy on High School Students' Comprehension of Lectures

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ABSTRACT

In previous research self-questioning strategies have been found to significantly improve *reading* comprehension, presumably because of the metacognitive nature of the self-questioning process. The purpose of the present study was to determine whether this metacognitive strategy also enhances *lecture* comprehension, that is, comprehension of non-text, orally-presented material. In a self-questioning combined with reciprocal peer-questioning condition, ninth graders were trained to pose questions for themselves during classroom lectures, and, following the lectures, they used their questions to engage in reciprocal peer-questioning and responding; students in a self-questioning only condition also engaged in self-questioning during the lectures and then answered their own questions; in a review condition, students discussed the lecture material in small cooperative groups; and in a control condition students reviewed the lecture material independently. On post-practice and 10-day maintenance tests participants in the self-questioning with reciprocal peer-questioning and the self-questioning only strategy groups showed lecture comprehension superior to that of participants in both the discussion review and control groups. These results suggest that: use of a self-questioning strategy can improve high school students' comprehension of lectures; students can maintain this strategy when external prompts are removed; and this metacognitive strategy can be readily taught to high school students and incorporated into their real-world classroom learning environment.

Effects of a Metacognitive Strategy on High School Students' Comprehension of Lectures

With the recent interest in the role that metacognition plays in learning, much emphasis has been placed on encouraging students to take a more active role in controlling their own learning process and on the direct instruction of metacognitive strategies in the classroom. Students who are aware of the cognitive processes they are using, and have learned how and when to apply these processes, are engaging in metacognitive behaviors and are on their way to becoming self-regulated learners (Flavell,1981; Palincsar & Brown, 1984). Unlike students who passively rely on the teacher to direct their learning, self-regulated learners consistently plan and orchestrate their own learning; they consciously select strategies, match strategy to task demands, and monitor their comprehension. Moreover, recent research indicates that students can be successfully trained to use these metacognitive strategies (e.g., Haller, Child & Walberg,1988; Pressley, Borkowski, & O'Sullivan,1984; Weinstein, 1988).

Self-Questioning. Weinstein and Mayer (1985) and Brown (1980) have identified several metacognitive strategies which self-regulated learners use to monitor their comprehension during learning; one of these strategies is self-questioning. Recent reviews by Bean (1985) and Wong (1985) have revealed that, at all levels of schooling, students who have been trained to use self-questioning show reading comprehension superior to that of those who use other strategies such as summarizing, rereading and answering teacher-posed questions. These results are presumably due to the metacognitive nature of the self-questioning process (Brown,1980; Haller, et al.,1988). It appears that self-questioning serves as a form of self-testing that helps the learner to monitor understanding of the material

presented. For example, a self-question such as How does this idea relate to what we learned before? may assist the learner to integrate the new information with prior knowledge; a comprehension-monitoring question such as What are the advantages and disadvantages of this idea? may alert the learner to gaps in understanding and trigger a follow-up question, How can I find out?, which may in turn suggest a remedial strategy such as listing attributes, reviewing notes, or rereading text passages. In a recent meta-analysis of the research on effects of various metacognitive strategies on reading comprehension, Haller et al. (1988) found this sort of self-questioning to be the most effective strategy.

As yet no studies have examined the effects of self-questioning on comprehension of material presented in lectures. If self-questioning is an effective comprehension strategy with written text, it might also facilitate processing material which is presented orally in lectures. Although written text and oral communication are quite different forms of presentation, Danks and End (1987) have argued that reading and listening impose similar cognitive demands on the learner; and, in fact, Townsend, Carrithers, and Bever (1987) have reported that learners' reading and listening comprehension appear to be highly related.

The ability to comprehend material presented in lectures is critical to academic success in high school where students receive so much information in lecture form. To learn from lectures students must comprehend the information presented, store it in memory, and be able to recall it at a later time, such as on an exam. Posing their own questions while listening to a lecture could enhance students' processing of the lecture content; for example, it could help them to make internal connections among ideas presented in the lecture, it could facilitate

building external connections to their existing knowledge, and it could promote their comprehension-monitoring. On the other hand, self-questioning may not be as effective a strategy with oral material as it is with written text. For example, the process of generating questions during a lecture may distract the learner from focusing attention on the ideas presented. Loss of attention is of particular concern in oral contexts since the learner cannot go back and reread (or relisten) in order to clarify meaning or answer a question, as is possible during reading. At the same time, effective listeners must use working memory capacity to organize information, relate it to prior knowledge, and rehearse it for storage in long term memory; however, the act of generating questions during a lecture may actually strain the capacity of working memory and interfere with these processes, and consequently may decrease the amount of material the learner can accurately encode. Therefore, self-questioning, when used with lecture material, may make greater demands on both attentional processes and on working memory than it does when used in a reading context; it is possible that these additional cognitive burdens may decrease the benefits of the self-questioning strategy when used in a lecture context.

Reciprocal/Cooperative Learning. There is some evidence to suggest that a cooperative self-questioning learning context may be more effective than independent use of the self-questioning strategy. Extensive research on cooperative learning has revealed that, at all levels of schooling and ability, subjects working in small learning groups generally outperform independent learners (Johnson, Maruyana, Johnson, Nelson & Skon,1981; Sharan, 1980). One explanation for these results is the notion of pooled expertise. In most cooperative learning groups each learner participates to the extent possible so that collaboratively the group reaches a level of understanding and

accomplishment not possible by any individual group member. Furthermore, the few studies which have examined effects of reciprocal questioning strategies suggest that a cooperative context may increase the effects of self-questioning. For example, Frase and Schwartz (1975) found that high school and college students who used reciprocal questioning as a study strategy scored higher on achievement tests than did those who independently reread the text. However, it is not clear how much of this effect was due to the questioning per se or to the reciprocal aspects of the strategy. Fantuzzo, Dimeff and Fox (1987) reported that college students using a reciprocal peer questioning strategy, in which they tested each other on multiple-choice questions, received higher exam scores than did independent learners who only wrote questions. Fantuzzo et al. attributed the success of this peer-questioning strategy, at least in part, to the mutual support system inherent in the reciprocal strategy. They argued that peer equity and mutual exchange were factors which operated to maintain these feelings of support. Palincsar and Brown (1984; Brown & Palincsar,1982) also reported impressive reading comprehension gains for elementary school students using a reciprocal teaching strategy which included self-questioning as a major component. By way of explanation of these effects, Brown and Palincsar (1988) pointed out that in these cooperative questioning contexts, the group provides mutual support, shared expertise, and models for expert questioning and responding. These few studies suggest that a cooperative learning context may enhance comprehension effects of a self-questioning strategy.

The present study was undertaken to investigate the effectiveness of self-questioning strategies on high school students' lecture comprehension. Ninth graders were selected as the sample because metacognitive

instruction has been found to be particularly effective at the junior high and early high school levels (Haller, et al., 1988). Participants in a self-questioning condition were expected to outperform those in a review condition on lecture comprehension, consistent with findings from studies using self-questioning strategies with *written* materials. It was further expected that students in a self-questioning combined with reciprocal peer-questioning condition would show better comprehension of lecture content than would those in a self-questioning only condition because of the added effect of the cooperative learning context. However, as previous research has shown, improved comprehension could result from cooperation alone, without the self-and peer-questioning component. Therefore, to further isolate the self-questioning and cooperative learning variables, it was decided to include a comparison group (a discussion review condition) that was cooperatively structured but did not use the self-questioning strategy. Because of the inherent cooperative structure of discussion groups, participants in this condition were expected to outperform students in a control group working independently using their usual preferred review strategies.

A second purpose of the study was to determine the viability of using such a self-questioning strategy in a real-world context as a regular aspect of classroom learning and instruction. Students were expected to be able to utilize the self-questioning strategy in the small group and individual learning contexts commonly used in high school lecture classes. On a lecture comprehension test given immediately after practice with their respective strategies in these contexts, students were expected to perform as indicated above, that is, performance would be highest for the self-questioning plus reciprocal peer-questioning group, followed by the self-

questioning only group, the discussion group, and finally the control group. However, truly self-regulated learners eventually learn and study alone without the advantage of peer input and without an externally-structured study session. Therefore, an additional question was: Will students trained in the self-questioning strategy use it on their own in a lecture context where they are not *instructed* to use the strategy and are not provided with a post lecture strategy-use session? On a comprehension test given after a lecture where external strategy prompts were not used, and post-lecture practice was not provided, it was expected that performance of students in the self-questioning strategy conditions would indicate some degree of strategy maintenance.

Method

Sample

Fifty-six Honors Program ninth graders enrolled in two sections of Freshman Honors World History in a southern California suburban high school participated in the study. Eligibility for the Honors Program was based on high academic performance in eighth grade English and History courses *as well as* superior scores on eighth grade standardized achievement tests in reading and mathematics. Students in the two classes were comparable on these criteria and were scheduled into one or the other of the two sections of Freshman Honors World History by the school computer. Both classes were scheduled during the mornings (periods 2 & 3), were taught by the same teacher, and covered the same curriculum using the same classroom and materials. Ethnic minority representation consisted of 53% in one class and 41% in the other. Most of the minority students were Asian or Southeast Asian and a few were Hispanic. Socio-economic status of the students

ranged from lower middle class to middle class. The ratio of males to females was 11 to 18 for one class and 15 to 12 for the other.

Procedure

One class was randomly assigned to the questioning treatments. Students within that class were then randomly assigned to either the self-questioning only or the self-questioning with reciprocal peer-questioning. Within the latter condition participants were randomly assigned to groups of three. Students in the other class were randomly assigned to either the discussion or control conditions and within the discussion treatment, groups of three were randomly formed. This procedure resulted in four strategy groups: self-questioning with reciprocal peer-questioning, (S-Q/P-Q, n=15); self-questioning only, (S-Q, n=14); discussion, (n=15); and independent review, an untreated control group (n=12).

In an effort to increase external validity, and to assess the real-world utility of the self-questioning strategy, the study was embedded within the structure of the existing history course. The study was designed in such a way that strategy training, practice with learning strategies, and testing were incorporated into the course as a means of learning and evaluating the regular course content. In this way all elements of the study became naturally-occurring classroom phenomena. Presumably this structure reflects that commonly found in high school classrooms where the course material is presented by teacher lecture, students study it in some manner (usually independently and occasionally in discussion groups), and then a test is given.

All participants were given a lecture comprehension pretest at the beginning of the study to gather baseline data. Following strategy training, participants practiced their strategies in the classroom setting in

conjunction with five course lectures. At the end of the fifth practice session, a test was given to assess participants' comprehension of that session's lecture. Essentially this postpractice test evaluated comprehension on "practiced" lecture material, since students had used their respective strategies to process this lecture. After 10 day's delay all participants listened to another course lecture without having been instructed to use their strategies; this time there was no post-lecture study session and students were tested on their comprehension of the lecture immediately after the lecture. The purpose of this test was to evaluate student performance on *unpracticed* material and to assess strategy maintenance.

Lecture Materials. Seven course lectures were selected for use in the study. Both classes were taught by the same teacher who rigidly followed written lecture notes for all seven presentations in order to maintain consistency between the two classes with regard to content covered, use of examples, and time allocated to topics. Students were not allowed to ask questions, take notes, or interrupt during the experimental lectures. These procedures helped to ensure that the in-class experience of the four groups was essentially the same and differed only with regard to the learning strategy used by students. The lectures were presented in logical order, maintaining the usual topic sequence for this course, and covered the following topics: geography and early history of Japan, external influences on Japan's history, Japan's fuedal system, the Shogun, the Samurai, Zen, the civil war in Japan, flourishing of the arts and growth of towns in medieval Japan, background of the American Revolution, causes of the French Revolution.

Strategy Training and Practice. Students in the two self-questioning conditions were provided with direct instruction in generating higher-order questions. First they learned to differentiate between factual questions (ones which require the learner to simply recall facts and ideas explicitly stated in the lecture), and higher-order questions (which require the learner to recall the facts and ideas but also to engage in application, analysis, interpretation, or evaluation of those ideas). Hamaker (1986) has argued that factual questions tend to elicit rote learning while higher-order questions elicit meaningful learning, and since the emphasis in this study was on meaningful learning, only higher-order questions were used. Then these students were provided with a set of generic question stems which they could use to guide them in asking higher-order comprehension questions specific to any presented content. This "question starters" approach to questioning training was used because it is a simple, effective strategy which provides structure and support for the student and is easy to internalize. A simple strategy was designed in order to avoid the possibility of students modifying or abandoning the strategy as Bean (1985) has pointed out often occurs when complex strategies are used. The students practiced using these stems to write and share specific high level questions until they had reached proficiency.

These students were also provided with a brief explanation of metacognition including a discussion of the beneficial effects of monitoring one's comprehension during learning. Then they learned to ask specific metacognitive (comprehension-monitoring) questions such as: What do I still not understand about this?

Total training time consisted of two 45-minute sessions. During training participants shared with the class examples of the questions that

they wrote. This sharing plus feedback provided models of well-constructed higher-order questions. (In pilot work with similar subjects this amount and type of training was sufficient for participants to reach proficiency in self-questioning.) Inspection of Table 1, which contains examples of question stems with sample student endings, shows that the question stems were designed to facilitate students' understanding of the lecture content, integration with prior knowledge, and comprehension-monitoring; that is, the question stems address both cognitive and metacognitive processes.

Students in the discussion and control conditions were also presented with the information on metacognition and the explanation of the benefits of constantly monitoring their comprehension during learning. This precaution was taken to avoid confounding of metacognitive knowledge with learning strategy.

Post-lecture practice sessions were 12 minutes in length. Pilot work with similar students indicated that this was adequate time for the task. During the five practice sessions each of the four groups utilized only its assigned processing strategy, that is, self-questioning with reciprocal peer-questioning, self-questioning working alone, discussion in small cooperative peer groups, or independent review of material. In the self-questioning combined with reciprocal peer-questioning condition students were instructed to generate questions during the lecture and then, following the lecture, to spend the first few minutes of the 12-minute session writing down two or three higher-order questions based on the lecture content. They were further instructed to pose their questions to the other members of their cooperative learning triads and, as a group, discuss possible answers. During their 12-minute post-lecture session the self-questioning only students first wrote down questions they had generated

during the lecture, and then proceeded to answer them working independently all the while. Students in the discussion and control groups were instructed to listen carefully to the ideas presented during the lecture; then, in the post-lecture session, students in the discussion triads engaged in unstructured discussion of the presented content, while those in the control group were told to review the material independently in any manner they wished (presumably their usual preferred review strategies).

Comprehension Tests

The pretest, postpractice, and maintenance tests of lecture comprehension were administered to all participants. These tests contained both multiple choice and open-ended questions, and the difficulty level of test items was set high in order to avoid the possibility of a ceiling effect. Test questions were designed to elicit higher-order thinking, requiring the learner to integrate several pieces of information, elaborate on ideas, analyze information or apply it in a new context. Two independent raters, blind to experimental condition, scored the open-ended questions on each of the three tests; they used the teacher's lecture notes as an indicator of content covered. Inter-rater reliabilities on the pretest, postpractice, and maintenance tests were .95, .93, and .95 respectively. In all cases of discrepant scores, an average was taken. The internal consistency coefficients for the three comprehension tests were .75, .78, and .80, well within the acceptable reliability range for experimental research (Gronlund, 1977).

Results

Preliminary analyses revealed no significant differences among the treatment groups on the lecture comprehension pretest; and there were no differences in comprehension due to the sex or ethnicity of students.

Comprehension

Figure 1 shows the performance of the four strategy groups on the pretest, the postpractice test, and the 10-day maintenance test. Inspection of Figure 1 reveals that, although comprehension means for the four groups were similar at pretest, differences in performance among the groups became apparent following strategy practice, and for the two questioning groups, this level of performance was maintained on the delayed maintenance test. In fact, the learning curves of the S-Q/P-Q and S-Q groups appear to closely parallel each other, with means on the postpractice and maintenance tests above that of both the discussion and control groups. Specifically, on the postpractice test there appears to be a clear ordering of the means for the four groups; performance was highest for the self-questioning plus reciprocal peer-questioning group, followed by the self-questioning only group, the discussion group, and finally the control group. Figure 1 shows this pattern of performance holding up on the delayed test with the exception that the discussion group's performance reverted to baseline.

Analyses of covariance (ANCOVA) were used to analyze participants' scores on the comprehension postpractice and maintenance tests; the comprehension pretest was used as a covariate in an effort to show statistical comparability among the treatment groups.

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The analysis on the postpractice test showed a significant effect for strategy, $F(3,51)=4.91$, $p<.01$. In post hoc analyses, the adjusted means of the four groups were compared using the Tukey (HSD) procedure with alpha

set at .05. (The critical range for pairs of means was 17.62.). Results indicated that both the S-Q/P-Q group and the S-Q group performed significantly better than the control group. The S-Q/P-Q vs Discussion comparison was marginally significant.

Although the S-Q/P-Q group performed better than the S-Q group, the comparison did not reach significance.

The ANCOVA on the 10-day maintenance comprehension test also revealed a significant effect for strategy, $F(3,51)=10.82$, $p<.001$. Tukey's HSD post hoc comparisons (alpha = .05) showed the reciprocal peer-questioning group scoring significantly higher than both the discussion and control groups; in addition, the mean for the self-questioning group only was significantly higher than that of both the discussion and control groups (critical range =15.49). Again, the difference between the means of the S-Q/P-Q and the S-Q groups was not significant. This finding suggests that students who had prior practice with the questioning strategies maintained their use of the strategies when external prompts and practice were removed.

These results uphold the study's general hypothesis in that students using the self-questioning strategies showed lecture comprehension superior to that of students using review strategies on both practiced and unpracticed lecture material. However, the findings do not support the hypotheses for cooperation. The reciprocal peer-questioning group did not perform significantly better than the self-questioning only group; furthermore, although the mean for the discussion (cooperative review) group was higher than that of the control (independent review) group on practiced lecture material, suggesting an effect for cooperation, these

effects disappeared on the delayed (unpracticed) test when the means for these two groups were essentially the same.

Questions

To determine whether the *quality* of questions generated changed over time for the self- and reciprocal peer-questioning group and the self-questioning only group, students' questions from each of the strategy practice sessions were rated by two independent raters for overall quality. A question's quality was judged in terms of the extent to which it required the learner to apply, interpret, analyze or evaluate lecture content. Average inter-rater reliability for the five sets of questions was .90. A 2(strategy) x 5(time) repeated measures analysis of variance on the ratings of questions generated during practice sessions revealed no significant differences between the self-questioning plus reciprocal peer-questioning and the self-questioning only strategy groups ($F < 1$), and no change over time for either group ($F < 1$). These results show that the quality of the questions generated by the two groups was comparable and neither improved nor deteriorated over the duration of the study. This finding suggests that the question stems were quickly adopted by the students and their use remained stable over the course of the five practice sessions; it further suggests that the question stems strategy may be relatively resistant to the kinds of learner modifications that Bean (1985) warned about.

Discussion

High school students in this study used a self-questioning strategy to improve their comprehension of classroom lectures. These results are consistent with research on the use of self-questioning in *reading* comprehension, and this study contributes to the literature on self-

questioning by extending these findings to a broader context of classroom learning which includes lectures.

Metacognition

Presumably the success of the self-questioning strategy with *lecture* comprehension can be attributed to the metacognitive aspects of self-questioning, as Brown (1980) and others (e.g., Haller, et al.,1988) have argued is the case with reading comprehension. Specifically, posing questions for themselves during the lectures probably helped students control their cognitive processes such as focusing attention on the lecture content, discerning the organization of ideas, and relating lecture material to their prior knowledge. Indeed, the question stems students were trained to use were specifically designed to enhance self-regulation of these very cognitive processes as well as to facilitate the metacognitive process of comprehension monitoring.

Cooperation

It is not clear exactly why the cooperatively structured self-questioning with reciprocal peer-questioning strategy group's performance on lecture comprehension was not superior to that of the self-questioning only group as expected. One possibility is that the mutual peer support function of the group did not play as prominent a role in learning as both Brown and Palincsar (1988) and Fantuzzo et al. (1987) have suggested it does. On the other hand, these bright, academically competent students were probably more adept at studying alone than in groups and, for those in the reciprocal peer-questioning group, an attempt to learn a new strategy in cooperative groups may have interfered with their learning proficiency. Effects of the reciprocal peer-questioning aspect of this strategy may be

stronger with less academically-able students where the benefits of peer input may be more evident.

Although there was some effect for cooperation in the discussion group on the postpractice test, this effect disappeared on the delayed maintenance test. This finding is not surprising since students did not work cooperatively to process this lecture and, therefore did not benefit from the shared expertise of their peers on the subsequent test. In fact, the mean for the discussion group on this "unpracticed" test was comparable to that of the control group and both were essentially unchanged from baseline.

Strategy Maintenance

The effect of the questioning strategies was surprisingly similar on both practiced and unpracticed lecture material. Prior to the maintenance test students had not used their strategies for 10 days, then they received a lecture on totally new material, they were not prompted to use their questioning strategy, and they were not given the opportunity to use their strategies in groups or independently following the lecture. However, the questioning strategy groups' performance on this comprehension test was again superior to that of the discussion and control groups and was comparable to their own previous performance on practiced material. This suggests that the self-questioning strategy had been maintained by these students and was deliberately called into service when a similar task was presented.

This indication of strategy maintenance is particularly encouraging in that the 10-day maintenance test closely replicated the learning circumstances which exist in most academic settings, that is, unguided, independent learning from lecture without the support of a peer study group and teacher-structured study sessions. Furthermore, the unprompted

application of strategies demonstrated in this study is an indication of self-regulation in learning and suggests the real-world utility of training in this self-questioning strategy.

Classroom Implementation

Finally, it should be noted that the use of self-questioning in this study suggests that this strategy can be successfully implemented in a regular high school classroom. Specifically, in this study use of the self-questioning strategy during lectures and in the post-lecture study sessions became a normal part of the course and, according to informal student feedback, was not perceived as obtrusive or unnatural.

References

Bean, T.W. (1985). Classroom questioning strategies: Directions for applied research. In A. Graesser & J.B. Black (Eds.) *The psychology of questions* (pp. 335-358) Hillsdale, NJ: Lawrence Erlbaum.

Brown, A.L. (1980) Metacognitive development and reading. In R.L.Spiro, B.B. Bruce, & W.F. Brewer (Eds.) *Theoretical issues in reading comprehension* (pp. 453-481) Hillsdale, NJ: Lawrence Erlbaum.

Brown A.L. & Palincsar, A.S. (1982) Inducing strategic learning from texts by means of informed, self-control training. *Topics in Learning and Learning Disabilities, 2* (1), 1-17.

Brown A.L. & Palincsar, A.S. (1988). Guided, cooperative learning and individual knowledge acquisition. In L. Resnick (Ed.), *Cognition and instruction: Issues and agendas,* (in press) Hillsdale, NJ: Lawrence Erlbaum.

Danks, J. H., & End, L.J. (1987). Processing strategies for reading and listening. In R. Horowitz & S. J. Samuels (Eds.) *Comprehending oral and written language* New York: Academic Press.

Fantuzzo, J. M., Dimeff, L.A. & Fox, S.L. (1987). Reciprocal peer tutoring: A multimodal assessment of effectiveness. Paper presented at the annual meeting of the American Psychological Association, New York.

Flavell, J.H. (1981). Cognitive monitoring. In W.P Dickson (Ed.), *Children's oral communication skills* New York, NY: Academic Press.

Frase, L.T. & Schwartz, B.J. (1975). Effect of question production and answering on prose recall. *Journal of Educational Psychology, 67,* 628-635.

Gronlund, N.E.(1977). *Constructing achievement tests* Englewood Cliffs, NJ: Prentice-Hall.

Haller, E. P., Child, D.A. & Walberg, H. J. (1988). Can comprehension be taught?. *Educational Researcher, 17*(9), 5-8.

Hamaker, C. (1986). The effects of adjunct questions on prose learning. *Review of Educational Research, 56*, 212-242.

Johnson, D.W., Maruyama, G., Johnson, R., Nelson, D., & Skon, L. (1981). Effects of cooperative, competitive, and individualistic goal structures on achievement: A meta-analysis. *Psychological Bulletin, 89*, 47-62.

Markman, E.M., & Gorin, L. (1981). Children's ability to adjust their standards for evaluating comprehension. *Journal of Educational Psychology, 73*, 320-325.

Palincsar, A.S. & Brown A.L. (1984). Reciprocal teaching of comprehension-fostering and monitoring activities. *Cognition and Instruction, 1*(2), 117-175.

Pressley, M., Borkowski, J.G., & O'Sullivan, J.T. (1984). Memory strategy instruction is made of this: Metamemory and durable strategy use. *Educational Psychologist, 19*, 94-107.

Sharan, S.(1980). Cooperative learning in small groups: Recent methods and effects on achievement, attitudes, and ethnic relations. *Review of Educational Research, 50*, 241-271.

Townsend, D.J., Carrithers, C., & Bever, T.G. (1987). Listening and reading processes in college- and middle school-age readers. In R. Horowitz & S.J. Samuels (Eds.) *Comprehending oral and written language* New York: Academic Press.

Weinstein, C. E.(1988). Assessment and training of student learning strategies. In R.R. Schmeck (Ed.), *Learning styles and learning strategies* New York: Putnam.

Weinstein, C. E. & Mayer, R.E.(1985). The teaching of learning strategies. In M.C. Wittrock (Ed.), *Handbook of research and teaching*, Third Edition. New York: Macmillan.

Wong, B.Y.L. (1985). Self-questioning instructional research: A review. *Review of Educational Research, 55*, 227-268.

Wong, B.Y.L. (1986). The efficacy of a self-questioning summarization strategy for use by underachievers and learning-disabled adolescents in social studies. *Learning Disabilities Focus, 2* (1), 20-35.

Table 1

Question Stems and Sample Questions Generated by Students

Stems	Student Questions
How are ... and ... alike?	How are Shintoism and Buddhism alike?
What is the main idea of...?	What are the main ideas about the mercantile system in England and America?
What do you think would happen if ...?	What do you think would have happened if the king and church didn't have all the power in France?
What are the strengths and weaknesses of...?	What were the strengths and weaknesses of the French government under Louis XIV?
In what way is ... related to ...?	Which ways is Japan related to the other civilizations that we learned?
How does...effect...?	How did the rise of power of the Shogun effect the development of Japanese government and culture?
Compare...and...with regard to....	Compare and contrast Japan's and Russia's isolation with regard to the way they developed and were influenced by other countries.
What do you think causes...?	What do you think caused Japan not to be conquered until World War II?
How does...tie in with what we have learned before?	How does Japan's government-military relationship tie in with what we learned before?
Which one is the best ... and why?	Which king was best for England? Why?
What are some possible solutions for the problem of...?	What are some possible solutions for the problem of the Russian serfs' land conditions?
Do you agree or disagree with this statement: ...? Support your answer.	Agree or disagree: The monarch had the most fault in starting the French Revolution.
What do I (you) still not understand about ... ?	What don't I know about Samurai family life?

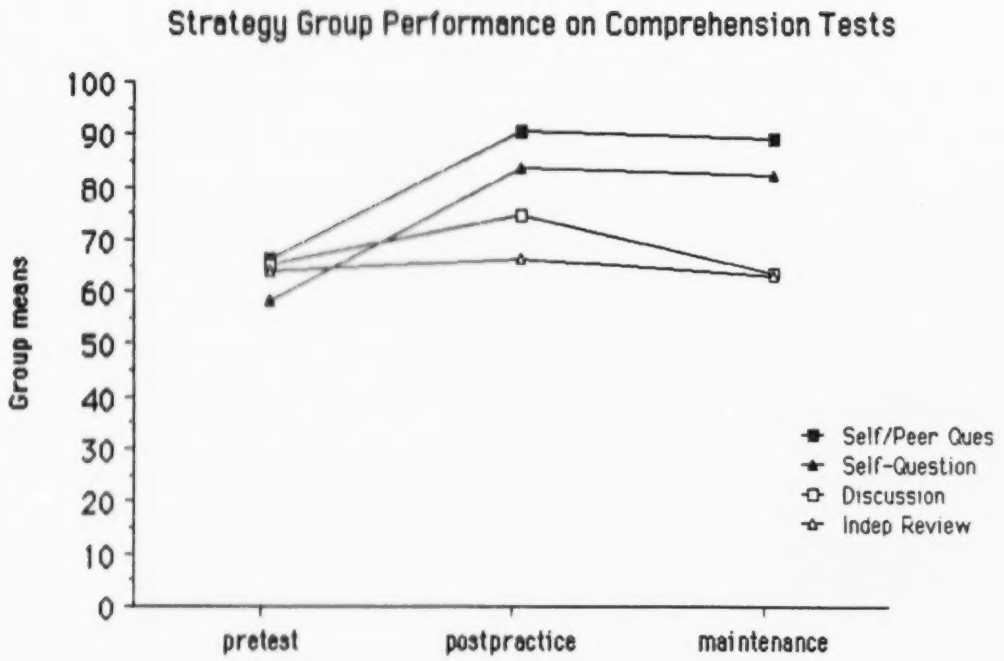
Strategy Group Performance on Comprehension Tests
Group means
100
90
80
70
60
50
40
30
20
10
0
pretest
postpractice
maintenance
Self/Peer Ques
Self-Question
Discussion
Indep Review

Figure Caption

Figure 1. Strategy group performance on comprehension tests